

ภาคผนวก จ

ใบรับรองการสอบเทียบเครื่องมือ



right solutions.  
right partner.

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	17-Oct-24	17-Oct-25	12
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Oil & Grease	Water Bath	BKK_EN0148	4-Jul-23	4-Jan-25	18
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0273	14-May-24	14-Nov-25	18
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	2-Aug-24	2-Aug-25	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0273	14-May-24	14-Nov-25	18
Water Lab	BOD	DO Meter	BKK_EN0017	16-Nov-23	16-May-25	18
Water Lab	BOD	Incubator	BKK_EN0304	20-Mar-24	20-Mar-25	12
Water Lab	BOD	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	COD	Hot Block	BKK_EN0222	22-Apr-24	22-Apr-25	12
Water Lab	COD	Spectrophotometer	BKK_EN0018	13-Sep-24	13-Sep-25	12
Water Lab	Lead	ICP-MS	BKK_EL0026	12-Dec-23	13-Jun-25	18
Water Lab	Lead	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Lead	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

Cert.No.: 24CH1295

Page.: 1 of 3

Equipment : pH Meter  
Manufacturer : Hach  
Model : HQ411d  
Serial No. : 200100031163  
ID No. : BKK\_EN0342  
Condition As-Received: Used Item  
Received Date : 16 October 2024  
Calibration Date : 17 October 2024  
Reference : 2410-0548DSC-5  
Submitted by :

REVIEW BY .....

APPROVED BY .....

NEXT CAL DATE.....17/10/25.....

Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 15) %  
Calibration Procedure : In - house method :  
- CP-CH5 by direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Saithip

Approved Signatory

( ) Unnopphol Harachai  
( ) Ponpan Paipim  
(✓) Saithip Meangmai

Issue Date : 21 October 2024

**The Uncertainties are for a confidence probability of approximately 95%**

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



Cert.No.: 24CH1295

Page.: 2 of 3

**Condition of this calibration result**

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1)Ref. Standard Thermometer	2188080	130RC044	24I1022	16 Sep 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials :The measurement results are traceable to SI through Hach Lenge GmbH Ltd.  
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00  
:The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.999	Hach Lenge GmbH	C03145	28 Feb 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

3. This certificate is valid only to the item calibrated on date and place of calibration.

**Calibration Results**

**Function : pH Measurement**

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

<u>Unit Under Calibration</u>	<u>Standard pH Buffer Solution</u>	<u>Actual pH Reading</u>	<u>Actual mV Reading (mV)</u>	<u>Uncertainty of pH Measurement (±)</u>	<u>Coverage factor k</u>
pH Electrode S/N.: 230473042902	4.008	4.028	174.6	0.0044	2.00
	6.999	7.014	1.4	0.0084	2.05
	10.010	10.018	-172.8	0.0066	2.00

**Remark** - Can not connect the BNC because the plug does not match with the socket.



Cert.No.: 24CH1295

Page.: 3 of 3

### **Calibration Results**

#### **Function : Temperature Measurement**

#### **( \* ) Without adjustment**

This equipment was connected with Temperature Probe;

- Model : PHC281

- Serial No. : 230473042902

Dimension of probe

- Length : 103 mm.

- Diameter : 12 mm.

- Immersion Depth : 90 mm.

Calibration Point ( °C )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty of measurement ( ± °C )	Coverage factor <i>k</i>
25.0	25.002	25.0	-0.002	0.13	2.00

**Remark : UUC\* = Unit Under Calibration**

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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**Sartorius (Thailand) Co., Ltd.**

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6 , e-mail: service.thailand@sartorius.com

NSC-TIS-TIS 17025  
CALIBRATION 0426**SARTORIUS**

REVIEW BY

Jinda K

APPROVED BY

Siriluk P

NEXT CAL DATE

02/08/25

# Certificate

## of Calibration

Model Number : MSE224S-100-DU

Description : Analytical Balance

Serial Number : 0027405555

ID No. : BKK\_EN0003

Manufacturer : Sartorius

Certificate No. : 24BCI0270

Issued Date : Monday, August 05, 2024

Reference No. : 240942

Page No. : 1 of 2

Customer Name : ALS Laboratory Group (Thailand)Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250.

Calibrated Place : Lab Room

Calibrated By : Mr.Chonchai Inthana

Calibration Date : Friday, August 02, 2024

Calibration

Procedure No. : This calibration was conducted by

Using in-house calibration procedure number (WI-003)

Based on UKAS LAB 14 : 2019

Metrological data :

Capacity : 220 g Readability : 0.0001 g

Ambients Conditions:

Temperature : 23.0 °C ± 5.0 °C

Humidity : 55.0 % RH ± 10.0 % RH

Pressure : ±

Reasons for calibration

☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ MaintenanceEquipment Condition: ☒ Good Operate ☐ Fair**Measurement Method****UKAS Publication Ref :Lab 14**

The measurement uncertainty stated is the expended uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.

**Traceability:**

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2,YCS011-522-00	TCS	M23081975	23-Aug-2025
Testo 174 H	Thermo-Hygrometer , Testo 174H	ENTECH	H/T 661303,H661140	12-Nov-2024

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division Sartorius (Thailand) Co., Ltd.

Mr.chonchai Intrhaha(Technical Manager)

SOP FM 33 03 February 2022

S  
T  
A  
M  
P

**Sartorius (Thailand) Co., Ltd.**

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

**SARTORIUS**

# Certificate of Calibration

Model Number : MSE224S-100-DU

Description : Analytical Balance

Serial Number : 0027405555

ID No. : BKK\_EN0003

Manufacturer : Sartorius

Certificate No. : 24BCI0270

Issued Date : Monday, August 05, 2024

Reference No. : 240942

Page No. : 2 of 2

## Calibration Results : Without Adjustment


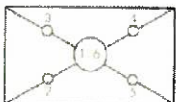
### Repeatability

The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	20.0000	200.0000
20 g	20.0000	199.9999
Tolerance	20.0001	200.0000
0.0001 g	20.0000	200.0000
	20.0000	200.0000
Nominal Value : (High Load)	20.0000	200.0000
200 g	20.0001	200.0001
Tolerance	20.0000	200.0000
0.0001 g	20.0000	199.9999
	20.0000	200.0000
Standard Deviation	0.00004	0.00006

### Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value :	100	g
Tolerance	0.0004	g
		
		
Difference		
1	-	
2	0.0000	
3	0.0000	
4	0.0000	
5	0.0001	
6	-	

### Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00015
0.1	0.1000	0.1000	0.0000	0.00015
1	1.0000	1.0000	0.0000	0.00015
2	2.0000	2.0000	0.0000	0.00015
5	5.0000	5.0000	0.0000	0.00015
10	10.0000	10.0000	0.0000	0.00015
20	20.0000	20.0000	0.0000	0.00015
50	50.0000	50.0001	0.0001	0.00016
100	100.0000	100.0001	0.0001	0.00019
200	200.0000	200.0000	0.0000	0.00029

End of Report.



# Metrological Center

## SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.com



Certificate No. T231303

Page 1 of 3

## Certificate of Calibration

Equipment : Liquid Bath ( Water )

Manufacturer : MEMMERT

Model : WNB29

Serial No. : L611.0135

Customer Code : BKK\_EN0148

ID No. : T6455A4

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,  
Khet Suan Luang, Bangkok 10250

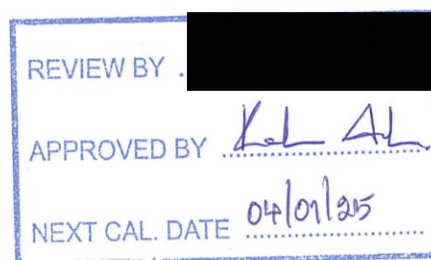
Customer Location : ORGANIC PREPARATION LAB

Date of Receipt : 27 June 2023

Calibrated By : Sujjar Naknakred ( Site Calibration Manager )

Approved By : [Redacted] / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 11 JUL 2023



The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

Certificate No. T231303

Page 2 of 3

## Calibration Report

**Equipment** : Liquid Bath ( Water )  
**Date of Calibration** : 4 July 2023  
**Environment** : Temperature : 22.2-22.5 °C  
Line Voltage : 221.6-224.8 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert five resistance thermometer detectors into its water bath , the other one thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T36 ( based on ASTM E715-80 ( Reapproved 2001 ) ).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 OHM	M18 (CH1,CH6-CH7,CH9-CH10)	T230545	10 April 2024
DATA LOGGER	34970A	T149	T230545	10 April 2024

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 3 Hour 45 Minute At 60 °C

5. Adjustment :

( X ) without adjustment

( ) after adjustment

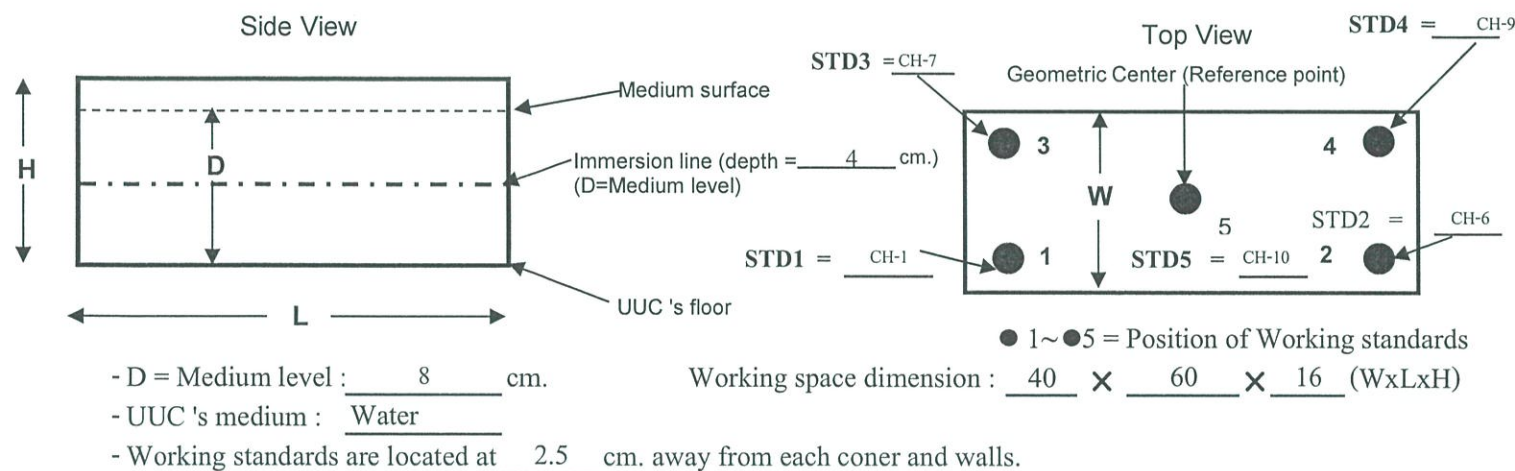
Approved By, \_\_\_\_\_



Certificate No. T231303

Page 3 of 3

## Calibration Report



### Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)				
	CH-1	CH-6	CH-7	CH-9	CH-10
60	60.03	60.06	60.24	60.11	60.18
85	84.79	84.83	85.42	85.05	85.20
95	93.71	93.83	94.62	94.15	94.42

Liquid Bath ( Water )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (±°C)	Uncertainty (±°C)	Coverage Factor <i>k</i>
	Min , Max	Average					
61.0	60.9 , 61.1	61.0	60.12	0.13	0.19	0.29	2.04
86.0	85.8 , 86.2	86.0	85.06	0.19	0.47	0.44	2.17
95.0	94.6 , 95	94.9	94.15	0.32	0.65	0.55	2.13

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By. 

Certificate No. T240904

Page 1 of 3

**Certificate of Calibration****Equipment : Chamber ( Oven )****Manufacturer : Memmert****Model : UF 450****Serial No. : B717.0531****Customer Code : BKK\_EN0273****ID No. : T8042A4****Customer : ALS Laboratory Group (Thailand) Co.,Ltd.**

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

**Customer Location : Laboratory (Oven Room)****Date of Receipt : 08 May 2024****Calibrated By : Preecha Phisassutthikul ( Temperature Calibration Manager )****Approved By : [Redacted] Nuafun Sungchum (Metrology Manager)****Date of Issue : 23 MAY 2024**

REVIEW BY	[Redacted]
APPROVED	[Redacted]
NEXT CAL. DATE	14/11/25

**The uncertainties are for a confidence probability of approximately 95%.**

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

Certificate No. T240904

Page 2 of 3

## Calibration Report

**Equipment** : Chamber ( Oven )  
**Date of Calibration** : 14 May 2024  
**Environment** : Temperature : 26.5-28.1 °C  
Line Voltage : 226.7-229.8 V  
Relative Humidity : 51 - 57 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors into its chamber , the other one resistance thermometer detector use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	21-(CH1-10)	T231955	17 November 2024
DATA LOGGER	34970A	T121	T231955	17 November 2024

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 30 Minute At 104 °C

Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

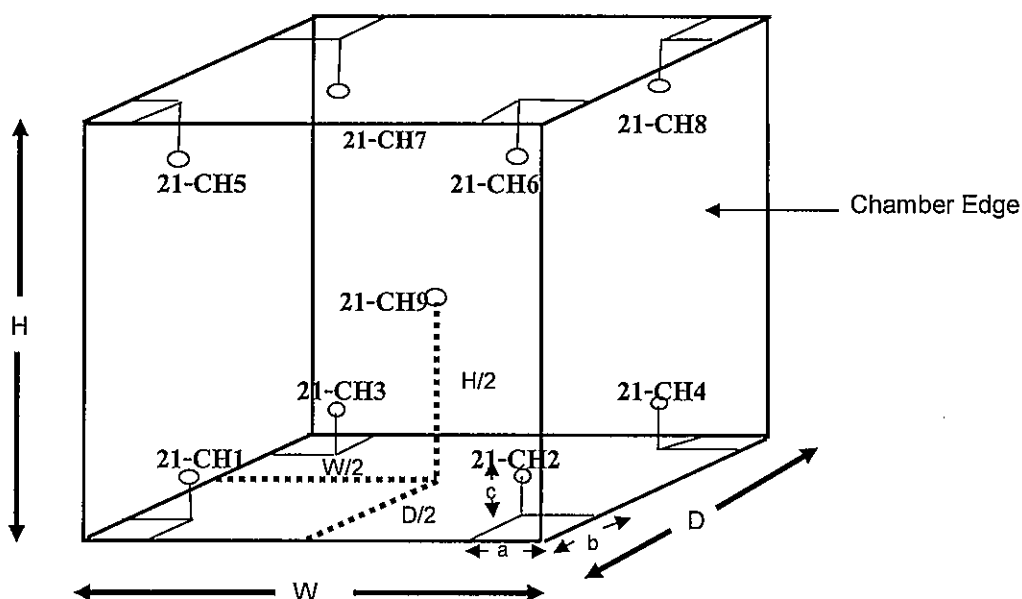
5. Adjustment :

( X ) without adjustment

'( ) after adjustment

Approved By \_\_\_\_\_

## Calibration Report



**Remark :**

Internal Dimensions of Chamber : W (Width) = 104 cm. , H(Height)=72 cm. and D(Depth)=60 cm.  
 Size of Installed Standard sensor number 21-CH1 to number 21-CH8 : a = 5 cm. , b = 5 cm. and c = 5 cm.  
 Size of Installed Standard sensor number 21-CH9 : W/2=104 cm./2 , H/2=72 cm./2 and D/2=60 cm./2

**Measurement Results**

Calibration Point	Average Standard Reading at each position (°C)								
	21-CH1	21-CH2	21-CH3	21-CH4	21-CH5	21-CH6	21-CH7	21-CH8	21-CH9
104	103.4	105.0	103.7	103.6	103.3	104.6	103.3	104.0	103.9
180	179.5	181.1	179.2	179.5	179.0	181.3	179.8	179.9	180.2

Chamber ( Oven )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average					
104.0	103.9 , 104	104.0	103.85	0.14	1.27	0.44	2.00
180.0	179.9 , 180.1	180.0	179.94	0.39	2.29	0.76	2.00

\* The quoted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

End of Certificate

Approved By \_\_\_\_\_



**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
**CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES**


534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250


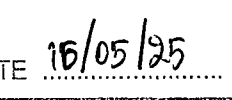
TEL. 0-2717-3000 FAX. 0-2719-9484

**Cert.No.:** 23TW243

**Page.:** 1 of 2

## Certificate of Testing

<b>Equipment :</b>	DO Meter
<b>Manufacturer :</b>	YSI
<b>Model :</b>	5000-230V
<b>Serial No. :</b>	09J101147
<b>ID No. :</b>	BKK_EN0017
<b>Received Date :</b>	15 November 2023
<b>Test Date :</b>	16 November 2023
<b>Reference :</b>	2311-0505DSC-4
<b>Submitted by :</b>	ALS Laboratory Group (Thailand) Co.,Ltd. 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250 Thailand
<b>Laboratory Condition :</b>	Temperature ( $25 \pm 5$ ) °C Humidity ( $50 \pm 20$ ) %
<b>Test Procedure :</b>	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
<b>Tested by :</b>	Walalak Sirithean
<b>Approved by :</b>	 Approved Signatory
(✓) Saithip Meangmai ( ) Warakorn Lerngagtrakul ( ) Ponpan Paipim	
<b>Issue Date :</b>	17 November 2023

REVIEW BY ...	
APPROVED BY	
NEXT CAL. DATE	16/05/25



Cert.No.: 23TW243

Page.: 2 of 2

**Condition of this result of calibration**

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Burette	-	130BU10	23CG1172	22 Mar 2025
2) Balance	1124013382	140RC006	23MM18	20 Feb 2024

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 16K100498

<b>Titration Method (Azide Modification Method) (mg/L)</b>	<b>DO Meter Reading (mg/L)</b>	<b>Standard Deviation (mg/L)</b>
8.18	8.18	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23LM192

Page.: 1 of 2

## Certificate of Calibration

**Equipment :** DO Meter with Sensor

**Manufacturer :** YSI

**Model :** 5000-230V

**Serial No. :** 09J101147

**ID No. :** BKK\_EN0017

**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

**Location :** TPA Chemistry Calibration Laboratory

**Received Order :** 15 November 2023


**Calibrated Date :** 16 November 2023

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :** Kunchit Promprat

**Approved by :**   
Approved Signatory

( ) Pornthippa Tameyakul  
( ) Ponpan Paipim  
(✓) Suwit Imjai

**Issue Date :** 17 November 2023

**The Uncertainties are for a confidence probability of approximately 95%**

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0060730



**Equipment :** DO Meter with Sensor  
**Condition As-Received :** Used Item  
**Reference :** 2311-0505DSC-10

**Cert. No.:** 23LM192

**Page.:** 2 of 2

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Digital Thermometer	3240076	231305	TPA	15 Mar 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

**Remark :** TPA : Technology Promotion Association ( Thailand - Japan )

**Result of Calibration :-** ( \* ) Without Adjustment

**Function :** Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 16K100498

<u>Calibration Point</u> ( °C )	<u>Immersion Depth</u> ( mm )	<u>Standard Temperature</u> ( °C )	<u>UUC* Reading</u> ( °C )	<u>Error</u> ( °C )	<u>Uncertainty</u> ( ± °C )	<u>Coverage Factor</u> <i>k</i>
20.0	60	19.997	19.93	-0.067	0.15	2.00

**UUC\* :** Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

-o0o-



**a 1190298**

**QUALITY CALIBRATION CO.,LTD.**

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com



CERTIFICATE No : 24T2852

REFERENCE No : 72619-8

PAGE : 1 OF 2

**Certificate of Calibration****EQUIPMENT** : COOLED INCUBATOR**MANUFACTURER** : MEMMERT**MODEL** : ICP750**SERIAL No** : F819.0021**ID No** : BKK\_EN0304**CONDITION AS RECEIVED** : USED ITEM**SUBMITTED BY** : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN  
RD.,KHWANG PHATTHANAKAN,KHET SUAN  
LUANG, BANGKOK 10250, THAILAND

REVIEW BY .....

APPROVED BY .....

NEXT CAL. DATE

90/03/25

**CALIBRATED BY** : CHAICHARN CH.**CALIBRATION DATE** : 20-Mar-24**APPROVED BY** : **ISSUED DATE** : 21-Mar-24**RECEIVED DATE** : 20-Mar-24



CERTIFICATE No : 24T2852

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : COOLED INCUBATOR  
MANUFACTURER : MEMMERT  
MODEL : ICP750  
ID No : BKK\_EN0304  
RECEIVED DATE : 20-Mar-24  
AMBIENT TEMPERATURE : 26 °C ± 1 °C

S/N : F819.0021  
CALIBRATION DATE : 20-Mar-24  
RELATIVE HUMIDITY : 54 %RH ± 10 %RH

### CONDITION OF THIS RESULTS OF CALIBRATION

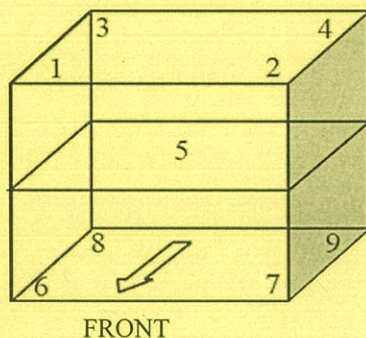
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOCOUPLE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

### 2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	7286308	23T6641	14-Jul-24

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.  
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.  
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



#### GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 1

Overall Line Voltage (V) variation : 5

Instrument Condition : Normal

#### CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.0	0.16	0.21	0.41

#### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
20.0	20.0	19.88	19.93	19.87	19.86	19.98	19.94	19.94	19.89	19.91	0.42

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2: LOCATION 5 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR  $k=2$ , PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL.0-2717-3000-29 FAX.0-2719-9484



## Certificate of Calibration

**Equipment :** Burette  
**Capacity :** 50 mL  
**Serial No. :** -  
**ID. No. :** BKK\_EN0171  
**Manufacturer :** Witeg  
**Made in :** Germany  
**Submitted by :** ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
**Ambient Temperature :** (20 ± 2.5) °C  
**Relative Humidity :** (50 ± 10) %  
**Barometric Pressure :** 760 mmHg  
**Calibration Procedure :** ASTM E 542 - 01

**Calibrated by :** Natcha Chayingcheiw

**Approved by :**

Approved Signatory

- ( ) Unnopphol Harachai  
(✓) Srisuda Khamtha  
( ) Sa-ngeunkam Wongsu

**Issue Date :** 27 February 2024

**The Uncertainties are for a confidence probability of approximately 95%**

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.



**Equipment :** Burette  
**Received Date :** 23 February 2024  
**Condition As-Received :** New Item  
**Calibration Date :** 27 February 2024  
**Reference :** 2402-0757DSC-1

**Cert.No.:** 24CG952  
**Page.:** 2 of 2

**Condition of this result of calibration**

1. Reference Standard Instruments :

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID. No.</u>	<u>Certificate No.</u>	<u>Traceability</u>	<u>Due date</u>
1) Balance	XP205DR	1126143764	140RC004	23MM538	TPA	15 Sep 2024
2) Thermo-Hygrograph	THDX-CE	00016540	140EC001	23H1275	TPA	09 June 2024
3) Thermometer	-	0834181	140EC005	23I948	TPA	10 Aug 2024

This certification is traceable to SI Unit

2. The certificate is valid only to the item calibrated on date and place of calibration.  
3. True value is converted to true volume at the standard temperature of 20 °C

**Calibration result :**

<b>Nominal capacity ( mL )</b>	<b>Reading ( mL )</b>	<b>Uncertainty ( ± mL )</b>	<b>k Factor</b>
50	50.0032	0.010	2.00

**Remark** mL = cm<sup>3</sup>

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k$ , providing a level of confidence of approximately 95 %.

-o0o-

Certificate No. T240741

Page 1 of 5

## Certificate of Calibration

Equipment : HOT BLOCK

Manufacturer : Environmental Express

Model : B3000- 240

Serial No. : 2017CODW116

Customer Code : BKK\_EN0222

ID No. : T6769A4

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

Customer Location : Wet Chemistry Lab2

Date of Receipt : 11 April 2024

Calibrated By : Sanee Musikawan ( Site Calibration Manager )

Approved By :  / Sujjar Naknakred (Site Calibration Manager)Date of Issue : 23 APR 2024

REVIEW BY .....	
APPROVED BY .....	
NEXT CAL. DATE	22/04/25

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.



# Metrological Center

## SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : www.scieco.co.th

E-Mail : calibrate@scg.co.th

Certificate No. T240741

Page 2 of 5

## Calibration Report

**Equipment** : HOT BLOCK  
**Date of Calibration** : 22 April 2024  
**Environment** : **Temperature** : 22.9-24.4 °C  
**Line Voltage** : 222.7-227.8 V  
**Relative Humidity** : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert 20 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ).

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN21-TN30	T240235	17 February 2025
TC	TYPE T	TN31-TN40	T240235	17 February 2025
DATA LOGGER	34970A	T195	T240235	17 February 2025

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 10 Minute At 150 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :

( X ) without adjustment

( ) after adjustment

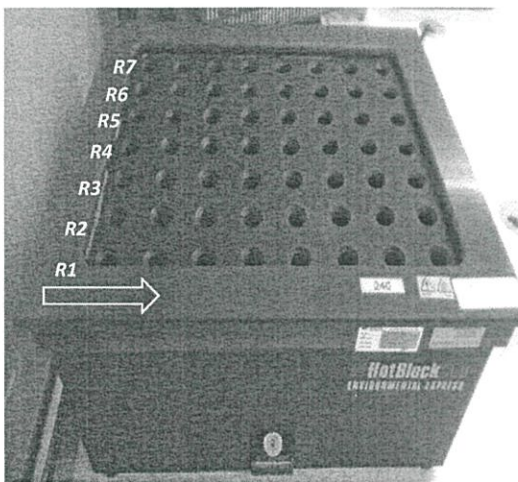
Approved By



Certificate No. T240741

Page 3 of 5

## Calibration Report



Row	Hole							
R7	H49	H50	H51	H52	H53	H54	H55	H56
R6	H41	H42	H43	H44	H45	H46	H47	H48
R5	H33	H34	H35	H36	H37	H38	H39	H40
R4	H25	H26	H27	H28	H29	H30	H31	H32
R3	H17	H18	H19	H20	H21	H22	H23	H24
R2	H9	H10	H11	H12	H13	H14	H15	H16
R1	H1	H2	H3	H4	H5	H6	H7	H8

H: STANDARD THERMOCOUPLE TYPE T

H1	=	TN21	H9	=	TN29	H17	=	TN37	H25	=	TN25	H33	=	TN33	H41	=	TN21	H49	=	TN29
H2	=	TN22	H10	=	TN30	H18	=	TN38	H26	=	TN26	H34	=	TN34	H42	=	TN22	H50	=	TN30
H3	=	TN23	H11	=	TN31	H19	=	TN39	H27	=	TN27	H35	=	TN35	H43	=	TN23	H51	=	TN31
H4	=	TN24	H12	=	TN32	H20	=	TN40	H28	=	TN28	H36	=	TN36	H44	=	TN24	H52	=	TN32
H5	=	TN25	H13	=	TN33	H21	=	TN21	H29	=	TN29	H37	=	TN37	H45	=	TN25	H53	=	TN33
H6	=	TN26	H14	=	TN34	H22	=	TN22	H30	=	TN30	H38	=	TN38	H46	=	TN26	H54	=	TN34
H7	=	TN27	H15	=	TN35	H23	=	TN23	H31	=	TN31	H39	=	TN39	H47	=	TN27	H55	=	TN35
H8	=	TN28	H16	=	TN36	H24	=	TN24	H32	=	TN32	H40	=	TN40	H48	=	TN28	H56	=	TN36

Approved By. \_\_\_\_\_

Certificate No. T240741

Page 4 of 5

## Calibration Report

### Measurement Results

			Average Standard Reading at each position ( ° C )									
Calibration Point			TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
150	150.0	Max	150.38	149.73	150.12	150.36	150.56	150.00	150.48	150.25	150.56	149.59
		Min	150.13	149.47	149.87	150.16	150.31	149.77	150.25	150.02	149.41	149.41
		Average	<i>150.23</i>	<i>149.59</i>	<i>149.96</i>	<i>150.24</i>	<i>150.41</i>	<i>149.87</i>	<i>150.36</i>	<i>150.12</i>	<i>150.45</i>	<i>149.51</i>
			TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40
		Max	150.17	150.28	150.28	150.37	150.09	149.96	149.86	149.75	150.63	150.13
		Min	149.94	150.03	150.01	150.18	149.88	149.69	149.68	149.57	150.41	149.96
		Average	<i>150.04</i>	<i>150.14</i>	<i>150.13</i>	<i>150.27</i>	<i>149.98</i>	<i>149.81</i>	<i>149.77</i>	<i>149.65</i>	<i>150.51</i>	<i>150.03</i>
			TN21	TN22	TN23	TN24	TN25	TN36	TN27	TN28	TN29	TN30
		Max	150.28	150.18	149.87	149.57	150.18	149.90	150.59	149.66	150.39	150.08
		Min	150.00	149.94	149.67	149.39	149.88	149.58	150.32	149.34	150.11	149.84
		Average	<i>150.14</i>	<i>150.07</i>	<i>149.77</i>	<i>149.49</i>	<i>150.04</i>	<i>149.75</i>	<i>150.48</i>	<i>149.52</i>	<i>150.26</i>	<i>149.97</i>
			TN31	TN32	TN33	TN34	TN35	TN36	TN37	TN38	TN39	TN40
		Max	150.38	149.71	150.18	149.97	150.03	150.05	150.21	150.07	<b>150.02</b>	<b>149.92</b>
		Min	150.12	149.49	149.87	149.66	149.71	149.71	149.89	149.79	<b>149.76</b>	<b>149.73</b>
		Average	<i>150.26</i>	<i>149.61</i>	<i>150.04</i>	<i>149.82</i>	<i>149.90</i>	<i>149.89</i>	<i>150.05</i>	<i>149.94</i>	<i>149.91</i>	<i>149.84</i>
			TN21	TN22	TN23	TN24	TN25	TN26	TN27	TN28	TN29	TN30
		Max	150.37	150.20	150.20	150.44	150.67	149.85	150.31	149.90	<b>150.36</b>	<b>149.62</b>
		Min	150.11	149.99	150.04	150.26	150.49	149.69	150.12	149.78	<b>150.20</b>	<b>149.40</b>
		Average	<i>150.25</i>	<i>150.12</i>	<i>150.14</i>	<i>150.34</i>	<i>150.57</i>	<i>149.78</i>	<i>150.20</i>	<i>149.83</i>	<i>150.29</i>	<i>149.52</i>
			TN31	TN32	TN33	TN34	TN35	TN36				
		Max	150.18	150.02	149.95	150.26	149.92	149.69				
		Min	150.06	149.88	149.79	150.12	149.80	149.58				
		Average	<i>150.13</i>	<i>149.95</i>	<i>149.89</i>	<i>150.18</i>	<i>149.84</i>	<i>149.64</i>				

Approved By. \_\_\_\_\_



# Metrological Center

## SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110

Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109

Website : [www.scieco.co.th](http://www.scieco.co.th)

E-Mail : [calibrate@scg.co.th](mailto:calibrate@scg.co.th)

Certificate No. T240741

Page 5 of 5

## Calibration Report

### Measurement Results

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability ( $\pm$ °C)	Uncertainty ( $\pm$ °C)
	Min , Max	Average		
150.0	150 , 150.1	150.0	0.20	0.83

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$  , providing a level of confidence of approximately 95 % .

Approved By. \_\_\_\_\_



# Certificate of Calibration

Number of Page(s) 1 of 3

**Certificate No.** BSCC-UV-374/24  
**Equipment** UV/Vis Spectrophotometer  
**Model** UV-1800  
**Manufacturer** Shimadzu  
**Serial No.** A11454908533 CD  
**ID No.** BKK\_EN0018  
**Date of receipt** 13 September 2024  
**Date of calibration** 13 September 2024  
**Date of issue** 13 SEP 2024

REVIEW BY ....

APPROVED BY .....

NEXT CAL. DATE 13/9/2025

**Customer name** ALS Laboratory Group (Thailand) Co., Ltd.

**Address** 104 Soi Phattanakan 40, Phattanakan Road, Phattanakan, Suan Luang, Bangkok 10250

**Temperature** (25.3 - 26.7) °C (On site)  
**Humidity** (50.4 - 55.9) %RH (On site)

**Equipment condition** Good Operation


**Calibration Location** Organic Preparation Lab

**Calibration Procedure** In-house method WI-UV-702-01 based on ASTM E275-01

**Traceability** Wavelength Accuracy is traceable to certificate No. 106372 and 106371  
Photometric Accuracy is traceable to certificate No. 106364 and 111398  
Stray Light is traceable to certificate No. 106377  
The above certificate are traceable to SI unit through Sarna Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

**Calibrated by** Mr.Wanchana Janloey

Approved by

  
Mr. Sornth Temboonsakdi  
Service Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.

# Certificate of Calibration

Certificate No.

BSCC-UV-374/24

Number of Page(s)

2 of 3

## Calibration Results:

### 1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty ( $\pm$ nm)
241.70	241.55	-0.15	0.18
334.02	333.85	-0.17	0.18
418.53	418.57	0.04	0.18
572.99	572.97	-0.02	0.18
879.41	879.17	-0.24	0.18

### 2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ( $\pm$ A)
235	0.0000	0.0000	0.0000	0.0075
	0.7171	0.7169	-0.0002	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8354	0.8345	-0.0009	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2786	0.2781	-0.0005	0.0075
350	0.0000	0.0000	0.0000	0.0075
	0.6199	0.6194	-0.0005	0.0075

\*CNR = Customer not request

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# Certificate of Calibration

Certificate No. **BSCC-UV-374/24**

Number of Page(s) **3 of 3**

## Calibration Results:

### 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ( $\pm A$ )
420.0	0.0000	0.0000	0.0000	0.0042
	0.5761	0.5765	0.0004	0.0042
	0.7119	0.7105	-0.0014	0.0042
	1.0189	1.0174	-0.0015	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5610	0.5613	0.0003	0.0042
	0.7001	0.6984	-0.0017	0.0042
	1.0026	1.0011	-0.0015	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5235	0.5232	-0.0003	0.0042
	0.6614	0.6598	-0.0016	0.0042
	0.9456	0.9444	-0.0012	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5249	0.5245	-0.0004	0.0042
	0.6975	0.6956	-0.0019	0.0042
	1.0009	0.9994	-0.0015	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5590	0.5586	-0.0004	0.0042
	0.7725	0.7708	-0.0017	0.0042
	1.1125	1.1114	-0.0011	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5666	0.5666	0.0000	0.0042
	0.7620	0.7604	-0.0016	0.0042
	1.0982	1.0971	-0.0011	0.0042

\*CNR = Customer not request

### 4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.85 $\pm$ 0.11nm	199.58	0.9520	2.0217

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

\*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

**\*\*\*End of Certificate\*\*\***

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
except in full, without written approval of the Bara Scientific Co., Ltd.


**Agilent Technologies**

Agilent Technologies (Thailand) Limited  
U CHU LIANG BLDG. 22/F UNIT A,D  
968 RAMA 4 ROAD, SILOM, BANGRAK  
Bangkok 10500 Thailand

Tel. +662 637 6363  
Fax: +662 632 4334  
Email: [ccc-smt@agilent.com](mailto:ccc-smt@agilent.com)  
Website: [www.agilent.com/chem](http://www.agilent.com/chem)

**Customer Contact:**

ALS Laboratory Group (Thailand) Co  
Ltd  
Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan  
TAX ID : 0105540004859  
[Chanattagarn.lmchom@alsglobal.com](mailto:Chanattagarn.lmchom@alsglobal.com)  
27603068

**Invoice To:**

ALS Laboratory Group (Thailand) Co  
Ltd  
Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

**Delivery Site:**

ALS Laboratory Group (Thailand) Co  
Ltd  
Head Office  
104 Phatthanakan 40 Phatthanakan Rd  
Khwaeng Phatthanakan Khet Suan

**Location:**

**Room**  
**Bldg**  
**Lab**  
**Dept**

**SERVICE REPORT**

<b>Customer Purchase Order Number:</b>	<b>Customer Number:</b> 70371013
<b>Service Request:</b>	<b>Service Request Date:</b>
<b>Service Order:</b> 6006041263	<b>Service Confirmation:</b> 6905338201

REVIEW BY ..	
APPROVED BY	
NEXT CAL. DATE 13/06/2025	

**Direct Inquiries to:**

Contact Name: Customer Contact Center  
Contact E-mail: [ccc-smt@agilent.com](mailto:ccc-smt@agilent.com)  
Contact Telephone: +662 637 6363  
Contact Fax: +662 632 4334

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Bangkok 10500 Thailand  
Tax ID : 0105542068218

Citibank N.A. Bangkok Branch  
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau  
Sub-district, Wattana District, Bangkok 10110 Thailand  
Acc. No: 012-4452-007 ,  
THB:Krung Thai Bank PCL  
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330  
Thailand

ORIGINAL

**Service Confirmation Number:** 6905338201

**Service Confirmation Date:** 12.12.2023

**Service Instrument:**

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7700-E	ICPMS 7700 System Enhanced		ICP MS 7700 (HPLC)	
G1316A	1260 Thermostatted Column Compartment	DEACN12300	ICP MS 7700 (HPLC)	SYS-IM-7700-E
G1329B	1260 Standard Autosampler	DEAAC11098	ICP MS 7700 (HPLC)	SYS-IM-7700-E
G1311B	1260 Quaternary Pump	DEAB704380	ICP MS 7700 (HPLC)	SYS-IM-7700-E
G3281A	Agilent 7700x ICP-MS	JP12091612	ICP MS 7700 (HPLC)	SYS-IM-7700-E

**Service Items:**



Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EOQ	Enterprise Operational Qualification	1.00	Agreement Entitlement - 100 % covered	12.12.2023	12.12.2023
1010	5185-5850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

**Additional Information:**

**Service Confirmation Number:** 6905338201

**Service Confirmation Date:** 12.12.2023

**Service Information:**

<b>Problem Description:</b> WU-OQ-IM/HPLC-7700-5001143313		
<b>Service Provided:</b> Perform OQ Hardware control test CSD logon, Autosample , ISIS , Auto tune , BG and Stability. After done the instrument BKK_EL0026 calibrated pass all.		
<b>Service Overview Code:</b> Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
<b>Reported Hours:</b> 6.0	<b>Travel Hours:</b> 1.0	
<b>Customer Field Service Representative Name:</b> Panthep Kurasathain	<b>Customer Field Service Representative Signature:</b> 	<b>Date:</b> 12 Dec 2023
<b>Customer Name:</b> Supakwan Mak	<b>Customer Signature:</b> 	<b>Date:</b> 12 Dec 2023
<b>Additional Comments:</b>		

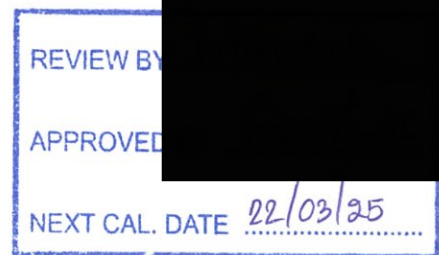
Certificate No. T231676

Page 1 of 6

**Certificate of Calibration****Equipment : HEATING BLOCK****Manufacturer : Environmental Express****Model : SC 196****Serial No. : 6974CECW3285****Customer Code : BKK\_EL0054****ID No. : T5306A3****Customer : ALS Laboratory Group (Thailand) Co.,Ltd.**

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

**Customer Location : Acid Digestion Lab****Date of Receipt : 13 September 2023****Calibrated By : Senee Musikawan ( Site Calibration Manager )****Approved By : [Redacted] / Sujjar Naknakred ( Site Calibration Manager )****Date of Issue : 26 SEP 2023**

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

Certificate No. T231676

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## Calibration Report

**Equipment** : HEATING BLOCK  
**Date of Calibration** : 22 September 2023  
**Environment** : Temperature : 21.8-23.1 °C  
Line Voltage : 221.6-226.3 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert 20 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN21-TN30	T230014	17 January 2024
TC	TYPE T	TN31-TN40	T230014	17 January 2024
DATA LOGGER	34970A	T151	T230014	17 January 2024

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

#### Equipment Description :

Time Constant 2 Hour 20 Minute At 95 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :

( ) without adjustment

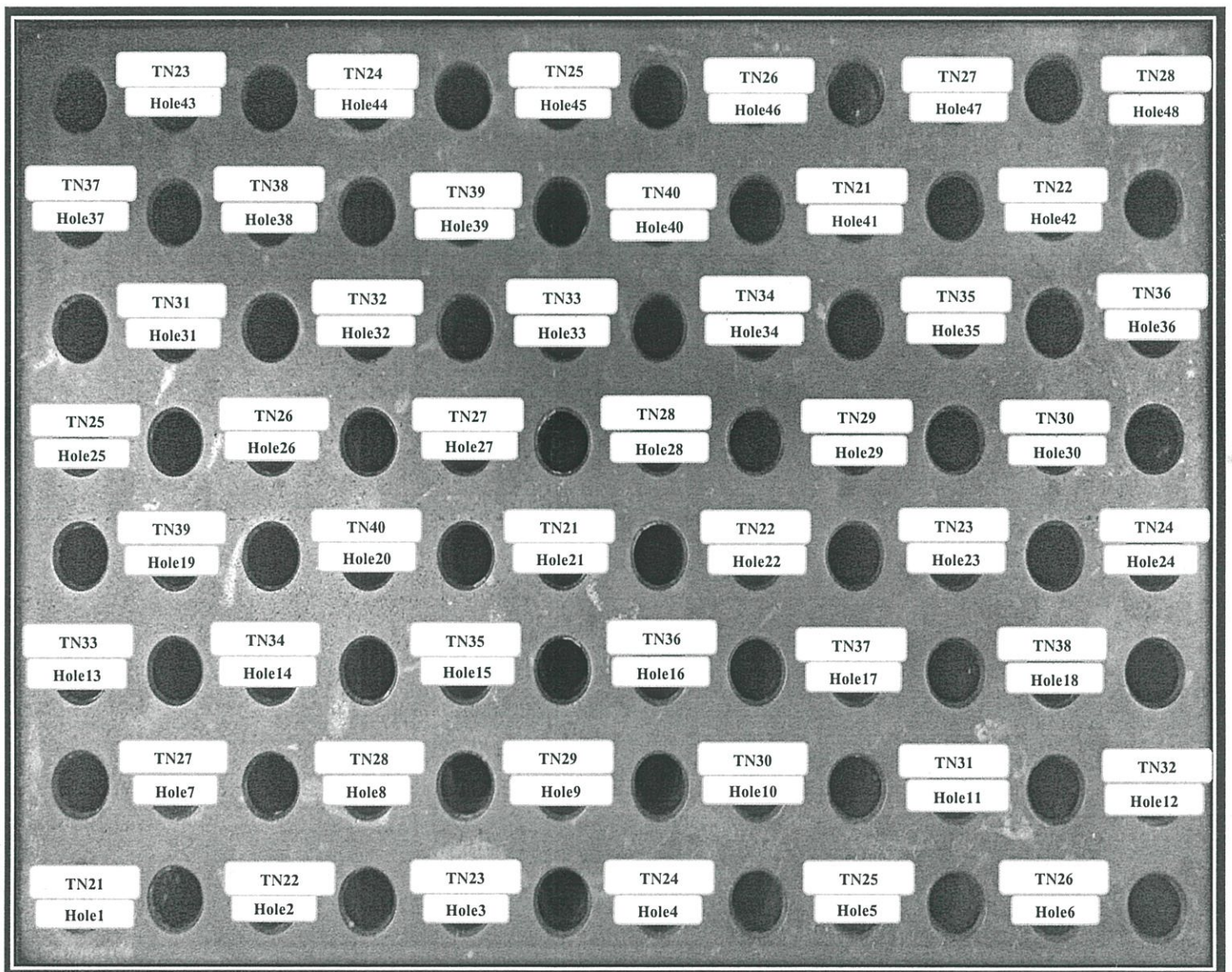
( X ) after adjustment

Approved By \_\_\_\_\_

Certificate No. T231676

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## Calibration Report



FRONT CONTROL

Approved By. \_\_\_\_\_



Certificate No T231676

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## Calibration Report

### Measurement Results

Calibration Point		Average Standard Reading at each position ( ° C )					
<b>R1 Hole1-Hole6</b>		<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>
CAL POINT	Max	95.01	94.41	95.20	95.41	94.51	95.17
95	Min	94.57	93.95	94.75	94.92	94.00	94.72
	Average	94.79	94.18	94.98	95.17	94.26	94.95
<b>R2 Hole7-Hole12</b>		<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>	<b>TN31</b>	<b>TN32</b>
	Max	95.36	95.43	95.19	95.16	95.35	94.97
	Min	94.94	94.95	94.72	94.71	94.90	94.57
	Average	95.15	95.19	94.96	94.94	95.13	94.77
<b>R3 Hole13-Hole18</b>		<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>	<b>TN37</b>	<b>TN38</b>
	Max	95.37	95.50	95.22	95.21	95.33	95.31
	Min	94.99	95.09	94.78	94.82	94.88	94.96
	Average	95.18	95.30	95.00	95.02	95.11	95.13
<b>R4 Hole19-Hole24</b>		<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>
	Max	95.59	94.42	94.52	94.24	94.63	94.67
	Min	95.21	94.06	94.13	93.88	94.28	94.27
	Average	95.40	94.24	94.33	94.06	94.45	94.47
<b>R5 Hole25-Hole30</b>		<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>
	Max	95.19	95.38	92.93	95.30	95.14	95.03
	Min	94.83	95.03	92.56	94.95	94.79	94.70
	Average	95.01	95.20	92.75	95.12	94.96	94.87
<b>R6 Hole31-Hole36</b>		<b>TN31</b>	<b>TN32</b>	<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>
	Max	94.63	94.90	94.77	94.31	94.24	93.87
	Min	94.24	94.55	94.44	93.98	93.92	93.56
	Average	94.43	94.72	94.60	94.14	94.08	93.71
<b>R7 Hole37-Hole42</b>		<b>TN37</b>	<b>TN38</b>	<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>
	Max	94.30	94.44	94.04	93.81	94.89	95.35
	Min	93.95	94.05	93.67	93.48	94.39	94.90
	Average	94.13	94.24	93.86	93.65	94.64	95.12
<b>R8 Hole43-Hole48</b>		<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>
	Max	95.99	95.63	95.28	95.29	95.45	94.87
	Min	95.57	95.15	94.82	94.84	94.99	94.48
	Average	95.78	95.39	95.05	95.07	95.22	94.68

Approved By. \_\_\_\_\_

Certificate No T231676

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## Calibration Report

### Measurement Results

Calibration Point		Average Standard Reading at each position ( ° C )					
<b>R1 Hole1-Hole6</b>		<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>
CAL POINT	Max	105.23	104.32	105.43	105.25	104.44	105.27
105	Min	104.94	103.95	105.15	105.04	104.11	104.96
	Average	105.09	104.13	105.29	105.15	104.28	105.12
<b>R2 Hole7-Hole12</b>		<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>	<b>TN31</b>	<b>TN32</b>
	Max	105.30	105.12	105.18	105.22	105.12	105.16
	Min	105.11	104.92	104.96	105.00	104.92	104.97
	Average	105.20	105.02	105.07	105.11	105.02	105.06
<b>R3 Hole13-Hole18</b>		<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>	<b>TN37</b>	<b>TN38</b>
	Max	105.37	105.63	105.02	104.80	104.69	105.19
	Min	105.17	105.37	104.75	104.59	104.50	105.00
	Average	105.27	105.50	104.88	104.69	104.60	105.09
<b>R4 Hole19-Hole24</b>		<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>	<b>TN23</b>	<b>TN24</b>
	Max	105.31	104.43	106.41	104.71	105.63	105.82
	Min	105.08	104.22	106.15	104.41	105.37	105.56
	Average	105.19	104.33	106.28	104.56	105.50	105.69
<b>R5 Hole25-Hole30</b>		<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>	<b>TN29</b>	<b>TN30</b>
	Max	104.95	106.26	103.34	105.78	105.59	105.87
	Min	104.67	105.96	103.08	105.56	105.36	105.68
	Average	104.81	106.11	103.21	105.67	105.48	105.77
<b>R6 Hole31-Hole36</b>		<b>TN31</b>	<b>TN32</b>	<b>TN33</b>	<b>TN34</b>	<b>TN35</b>	<b>TN36</b>
	Max	104.75	104.86	104.80	105.20	104.50	104.39
	Min	104.54	104.63	104.59	105.00	104.32	104.18
	Average	104.65	104.75	104.69	105.10	104.41	104.28
<b>R7 Hole37-Hole42</b>		<b>TN37</b>	<b>TN38</b>	<b>TN39</b>	<b>TN40</b>	<b>TN21</b>	<b>TN22</b>
	Max	104.30	104.90	104.85	104.65	104.88	104.85
	Min	104.09	104.72	104.66	104.49	104.63	104.52
	Average	104.19	104.81	104.75	104.57	104.76	104.68
<b>R8 Hole43-Hole48</b>		<b>TN23</b>	<b>TN24</b>	<b>TN25</b>	<b>TN26</b>	<b>TN27</b>	<b>TN28</b>
	Max	105.71	105.85	105.39	105.61	105.42	105.19
	Min	105.45	105.61	105.14	105.27	105.18	104.94
	Average	105.58	105.73	105.27	105.44	105.30	105.07

Approved By. \_\_\_\_\_

Certificate No. T231676

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## Calibration Report

### Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting ( °C )	Reading ( °C )		Stability ( ± °C )	Uncertainty ( ± °C )
	Min , Max	Average		
100.0	100.3 , 100.5	100.4	0.26	0.81
107.0	107.0 , 107.1	107.1	0.19	0.78

\* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k$  which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By. \_\_\_\_\_



# Metrology

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.

Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100

Bangkok Tel : +668 9205 6851 , +669 8247 2360

Website : www.scieco.co.th E-Mail : calibrate@scg.com



Certificate No. T232160

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Cooling Room )

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK\_EN0167

ID No. : T2463A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.


104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,

Khet Suan Luang, Bangkok 10250

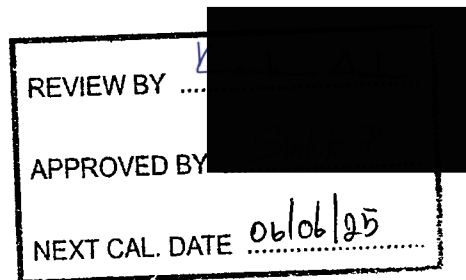
Customer Location : Laboratory

Date of Receipt : 29 November 2023

Calibrated By : Atiphong Rongrat ( Technician )

Approved By :  / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 09 JAN 2024



The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrology.

Certificate No. T232160

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## Calibration Report

**Equipment** : Chamber ( Cooling Room )  
**Date of Calibration** : 6 December 2023  
**Environment** : Temperature : 23.4-24.9 °C  
Line Voltage : 221.4-230.2 V  
Relative Humidity : 55 - 65 %RH

### Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001) and AS2853-1986 ).  
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T230773	10 April 2024
TC	TYPE T	TN171-TN180	T230773	10 April 2024
DATA LOGGER	34970A	T149	T230773	10 April 2024

3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant 1 Hour 30 Minute At 3 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :

( X ) without adjustment

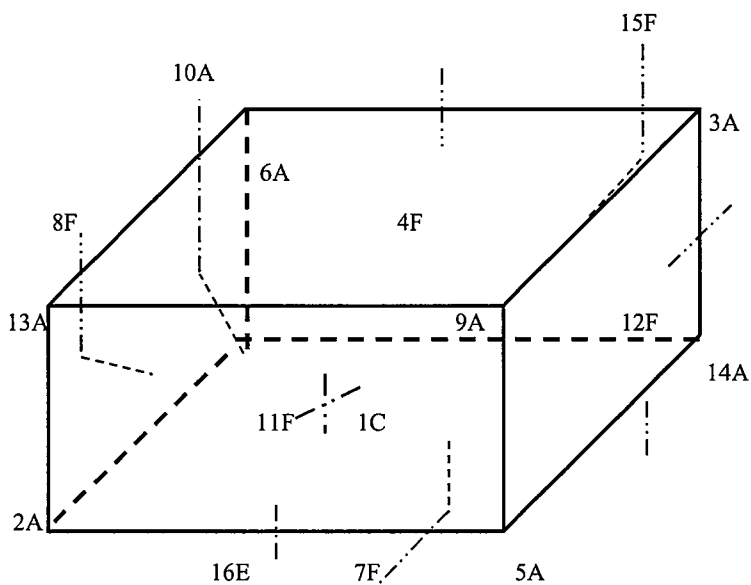
( ) after adjustment

Approved By. \_\_\_\_\_

Certificate No. T232160

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## Calibration Report



C = Centre , F = Centre of Face , A = Corner , E = Centre of Edge

1C	=	TN161
2A	=	TN162
3A	=	TN163
4F	=	TN164
5A	=	TN165
6A	=	TN166
7F	=	TN167
8F	=	TN168
9A	=	TN169
10A	=	TN170
11F	=	TN171

12F	=	TN172
13A	=	TN173
14A	=	TN174
15F	=	TN175
16E	=	TN176

Approved By. \_\_\_\_\_



Certificate No. T232160

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## Calibration Report

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)											
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170	TN171	TN172
3.0	2.83	3.34	2.95	3.46	3.45	3.76	3.25	3.46	3.39	3.50	3.58	3.42
	TN173	TN174	TN175	TN176								
	3.33	3.39	3.15	3.43								

Chamber ( Cooling Room )			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
	Min , Max	Average					
3.0	2.8 , 4.1	3.5	3.36	1.10	2.00	1.90	2.09

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By. \_\_\_\_\_

